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| 10/789,542 | 02/27/2004 | Jennifer L. West | 1789-03506 | 9465 |

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CONLEY ROSE, P.C.
P. O. BOX 3267
HOUSTON, TX 77253-3267

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| EXAMINER |
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COUNTS, GARY W

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| ART UNIT | PAPER NUMBER |
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1641

DATE MAILED: 09/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/789,542

Applicant(s)

WEST ET AL.

Examiner

Gary W. Counts

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 03/25/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

Status of the claims

The amendment filed June 27, 2005 is acknowledged and has been entered.

Election/Restrictions

1. Newly submitted claim 21 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claim 21 requires that said shell being such that the absorbance maximum can be controlled by controlling the size of the shell layer and claims 1-20 do not require this limitation. Further, claims 1-20 require the thickness of a shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer and claim 21 does not require this limitation.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 21 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter

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which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. On page 4, lines 11-15 in the specification. The applicant discloses the relative thickness, and choice of materials, metal nanoshells can be fabricated that will absorb or scatter light at any wavelength across much of the ultraviolet, visible and infrared range of the electromagnetic spectrum. On page 5, lines 3-5 the applicant discloses that the terms "independently defined radius" and independently defined thickness" mean that the desired thickness of each of the shell and core can be chosen and formed without dictating or requiring a certain thickness of the other. Further, co-pending application 09/038,377 filed March 11, 1998, now U.S. Patent No. 6,344,272 , col 3, lines 59-64 discloses that while the metal nanoshells of the present invention may be much smaller than a wavelength of light, they are not limited in the thickness of their metal shells to account for the bulk dielectric properties of the metal comprising the shell. In fact, due to the one-atom-or-molecule-at-a-time approach to building the metal shell disclosed by the present inventors, the thickness of the metal shell may be controlled from as low as atomic thicknesses. The applicant does not disclose the thickness of said shell layer is independent of the radius of said inner layer and is less than the thickness of a shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer. There is no description in the specification or co-pending applications 09/616/154 or 09/038,377 disclosing the thickness of said shell layer is independent of the radius of said inner layer and is less

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than the thickness of a shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, lines 5 and 6 the recitation "the thickness of a shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer" is vague and indefinite. It is unclear what applicant intends. Is the thickness of the shell layer of the nanoparticle compared to the thickness of a shell layer whose properties are described by a bulk dielectric property of the material of another nanoparticle and determined to be less or does applicant intend something else? Please clarify.

Claim 1, line 6 the recitation "described by a bulk dielectric property" is vague and indefinite. It is unclear what applicant intends. Is applicant referring to the bulk dielectric property or is it something else dealing with the bulk dielectric property? What description of the bulk dielectric property does applicant intend?

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. For the purpose of art rejections the priority date has been designated as February 27, 2004 because the parent applications 09/616,154 and 09/038,377 do not contain the limitation the thickness of the shell layer is independent of the radius of the inner layer and is less than the thickness of a shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer. Therefore, the priority date of the parent has not been granted.

8. Claims 1, 16, 17 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Oldenburg et al. (Infrared extinction properties of gold nanoshells, Applied Physics Letters, Vol. 75, No. 19, Nov. 1999, pgs, 2897 – 2899).

Oldenburg et al disclose nanoparticles comprising gold shells with silica cores. Oldenburg et al disclose that the thickness of the shell is independent of the radius of the core (inner layer).

With respect to the recitation wherein the thickness of the shell layer is independent of the radius of the inner layer and is less than the thickness of a shell layer whose properties re described by a bulk dielectric property of the material comprising the shell layer. Since Oldenburg et al disclose the same nanoparticle comprising the same core, same shell and same shell thickness as the instantly recited

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claims, and further since it is unclear what the phrase means and unclear what is being done (see 112 2nd rejection above), the shell and shell thickness of Oldenburg et al would have a thickness less than the shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer. Thus, Schultz et al anticipates the claims.

9. Claims 1-10, 13 and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Schultz et al (US 6,180,415).

Schultz et al disclose resonant scattering particles comprised of a dielectric core (non-conducting) and an outer shell comprised of gold or silver (col 5, lines 14-15 and col 10, lines 1-5). Schultz et al disclose that these particles may be used in diagnostic applications. The particles have surface-attached ligands adapted to bind to ligand-binding sites on a target. Schultz et al disclose that the ligands are one of the members of a conjugate part that can include antigen/antibody, enzyme/substrate. Schultz et al disclose that different surface localized molecules may be different ligands effective to bind to different ligand-binding sites. Schultz et al also disclose that the particles have a spectral emission wavelength in one of three ranges >700 nm, 400-700 nm and <400 nm. (col 23, lines 1-61). Schultz et al disclose that these particles can be tuned to a desired frequency (col 32, lines 41-52). Schultz et al disclose that these particles are capable of inducing surface enhanced Raman scattering (col 49, lines 1-50). Schultz et al disclose that these particles are immobilized to a substrate (support) and the optical scattering parameters of each particle are recorded (col 44, lines 9-17). Schultz et al

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also disclose that the substrate may be nitrocellulose (permeable material). Schultz et al also disclose that these particles can be arrayed on a support such as glass. Schultz et al disclose that these particles can be used in sandwich, direct and indirect assays (see examples).

With respect to the thickness of the shell layer is independent of the radius of the inner layer as recited in the instant claims. Schultz et al disclose that the particle can be spherical and gives a range for the thickness of the shell. Therefore, Schultz et al teaches a particle wherein the thickness of the shell layer is independent of the radius of the inner layer. Further, the instant claims are directed to a particle and regardless how the particle is made, as long as the particle has a metal shell thickness and a non-conducting inner layer, Shultz et al anticipates the claims.

With respect to the wherein "the thickness of the shell layer is independent of the radius of the inner layer and is less than the thickness of a shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer" as recited in the instant claims. Since it is unclear what the phrase means and unclear what is being done (see 112 2nd rejection above), and further, since Schultz et al disclose the same shell material (silver) as applicant discloses in the specification and since Schultz et al disclose the shell thickness can be at least 3 nm, preferably 5 nm or more which falls within the range disclosed by applicant on page 9, lines 6 and 7 of the current application (shell thickness being about 1-100 nm). The shell and shell thickness of Schultz et al would have a thickness less than the shell layer whose properties are

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described by a bulk dielectric property of the material comprising the shell layer. Thus, Schultz et al anticipates the claims.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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13. Claims 11, 12, 14, 15, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schultz et al in view of Birnboim et al (US 5,023,139).

See above for teachings of Schultz et al.

Schultz et al differ from the instant invention in failing to teach the inner layer comprises silicon dioxide.

Birnboim et al disclose particles comprising a non-conducting inner layer (silica) surrounded by a metal shell (gold) (col 1, lines 59-68) (claims 1, 11, 13). Birnboim et al disclose that by altering the shell thickness of the particles that they can be tuned from ultraviolet to infrared range of the electromagnetic spectrum. These particles provide for nonlinear optical materials which result in an increased polarization.

It would have been obvious to one of ordinary skill in the art to incorporate silica as taught by Birnboim et al into the particles of Schultz et al because Birnboim et al show that this material provides for particles that provide for nonlinear optical materials which result in an increased polarization.

With respect to the particles substantially matches the wavelength of light emitted from a predetermined source of the radiation. Since the combination of Schultz et al and Birnboim et al disclose the same non-conducting inner layer and same metal shell as recited in the claims. It would have been obvious to one of ordinary skill in the art that the wavelength of light that is maximally absorbed or scattered by the particles substantially matches the wavelength of light emitted from a predetermined source of radiation.

With respect to the wavelength absorbance or scattering wavelength maximum as recited in the instant claims. Since the combination of Schultz et al and Birnboim et al disclose the same non-conducting inner layer and same metal shell as recited in the claims. And because Schultz et al specifically teaches that the particles have a spectral emission wavelength in one of three ranges >700 nm, $400-700$ nm and <400 nm. (col 23, lines 1-61). It would have been obvious to one of ordinary skill in the art that the maximum absorbance or scattering wavelength maximum would fall within the recited ranges.

14. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schultz et al in view of Sarkar et al (Plasmon Resonance Shifts of Au-coated Au_2 Nanoshells: Insight into Multicomponent Nanoparticle Growth, The American Physical society, June 1997 pgs 4217-4220).

See above for teachings of Schultz et al.

Schultz et al differ from the instant invention in failing to teach the particle has an inner layer of gold sulfide and a shell of gold.

Sarkar et al disclose particles that are comprised of a gold sulfide core (inner layer) and a gold shell. Sarkar et al disclose that the gold nanoshells possess quite remarkable optical properties that differ dramatically from those of solid gold nanoparticles and that these particles provide for unique redshifting of the nanoparticle plasmon resonance to wavelengths in the visible and near infrared spectrum (page 4217).

It would have been obvious to one of ordinary skill in the art to incorporate a gold sulfide core and a shell of gold as taught by Sarkar et al for the particles of Schultz et al

because Sarkar et al shows that these gold nanoshells possess quite remarkable optical properties that differ dramatically from those of solid gold nanoparticles and that these particles provide for unique redshifting of the nanoparticle plasmon resonance to wavelengths in the visible and near infrared spectrum.

With respect to the specific particle diameters, inner layer diameters and shell thickness as recited in the claims. The optimum condition diameters and shell thickness can be determined by routine experimentation and thus would have been obvious to one of ordinary skill in the art. Further, it has long been settled to be no more than routine experimentation for one of ordinary skill in the art to discover an optimum value of a result effective variable. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum of workable ranges by routine experimentation." Application of *Aller*, 220 F.2d 454,456, 105 USPQ 233, 235-236 (C.C.P.A. 1955). "No invention is involved in discovering optimum ranges of a process by routine experimentation." *Id.* At 458,105 USPQ at 236-237. The "discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art." Application of *Boesch*, 617 F.2d 272,276, 205 USPQ 215, 218-219 (C.C.P.A. 1980).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claim 1 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 52 of U.S. Patent No. 6,344,272. Although the conflicting claims are not identical, they are not patentably distinct from each other because it would have been obvious to one of ordinary skill in the art to use more than a single nanoparticle for an application of the nanoparticle.

Response to Arguments

15. Applicant's arguments filed June 27, 2005 have been fully considered but they are not persuasive.

Applicant argues that the 102 rejection of Oldenburg paper is obviated by the applicants establishment of entitlement to priority as originally claimed. This is not found persuasive because as stated above none of the priority documents contain the limitation wherein the thickness of said shell layer is independent of the radius of said inner layer and is less than the thickness of a shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer. Therefore, the rejection has been maintained.

Applicant argues that Schultz et al fails to teach particles having a shell layer with a thickness that is less than the thickness of a shell layer whose properties are described by a bulk dielectric property. This is not found persuasive because as stated

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above it is unclear what applicant intends (see 112 2nd rejections above) and since Schultz et al disclose the same shell material (silver) as applicant discloses in the specification and since Schultz et al disclose the shell thickness can be at least 3 nm, preferably 5 nm or more which falls within the range disclosed by applicant on page 9, lines 6 and 7 of the current application (shell thickness being about 1-100 nm). The shell and shell thickness of Schultz et al would have a thickness less than the shell layer whose properties are described by a bulk dielectric property of the material comprising the shell layer. Thus, Schultz et al reads on the instantly recited claims.

Applicant argues that the particles made by the method disclosed in Schultz et al possess the plasmon resonance of a solid metal particle. This is not found persuasive because although Schultz et al does teach making the particle by immobilizing it to a solid support and then performing enhancing, Schultz et al also disclose that the particle can be made by a variety of known methods, concluding colloidal chemistry, soluble gel, evaporation/annealing, nucleation/growth via an enhancer, autoradiography and photoreaction in silver halides (col 23). Further, the instant claims are directed to a product and not a process of making the product. Thus, determination of patentability is based on the product itself, the patentability of a product does not depend on its method of production. If the product in a product by process claim is the same or obvious form a product in the prior art then the claim is unpatentable.

Applicant argues that Birnboim et al does not teach or suggest nanoparticle in which "the thickness of said shell layer is less than that of a shell layer whose dielectric properties are described by a bulk dielectric function of a material comprising said shell

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layer.”. This is not found persuasive because the Examiner has not relied upon Birnboim et al for teaching this limitation. Examiner has relied upon Schultz et al for reading on this limitation. Birnboim et al is relied upon for teaching the inner layer comprises silicon dioxide.

Applicant argues that the Sarkar et al reference teach that the gold sulfide core radius necessarily grows at the same time that the gold shell is grown. Hence, in Sarkar et al the radius of the core and the thickness of gold shell are not independent of each other and that Applicants' require that the thickness of the shell layer be independent of the radius of the inner layer. This is not found persuasive because Examiner has not relied upon Sarkar for the independent of the radius and the shell but rather has relied upon Sarkar for teaching what a materials can make up the core and shell of a nanoparticle. Schultz et al is relied upon for teaching the shell thickness is independent of the core and teaching adjusting the size of the particle to change the absorbance. Therefore, the combination of Schultz et al and Sarkar et al is deemed to the proper and the rejection maintained.

Conclusion

16. No claims are allowed.

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary W. Counts whose telephone number is (571) 2720817. The examiner can normally be reached on M-F 8:00 - 4:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on (571) 272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Gary Counts

Examiner

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August 30, 2005



LONG V. LE

SUPERVISORY PATENT EXAMINER

TECHNOLOGY CENTER 1600

08/30/05